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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/714,304	11/14/2003	Chao-Cheng Chen	TS02-210	2110
42717	7590	08/23/2005	EXAMINER	
HAYNES AND BOONE, LLP 901 MAIN STREET, SUITE 3100 DALLAS, TX 75202			ESTRADA, MICHELLE	
			ART UNIT	PAPER NUMBER
			2823	

DATE MAILED: 08/23/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/714,304

Applicant(s)

CHEN ET AL.

Examiner

Michelle Estrada

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 13 June 2005.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-50 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 15,20-22 and 43-50 is/are allowed.
- 6) ☒ Claim(s) 1,4-8,10-14,16,18 and 19 is/are rejected.
- 7) ☒ Claim(s) 2,3,9,17 and 23-42 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Objections

Claims 23-42 are objected to because of the following informalities:

Claim 23, lines 13 and 14 recite "the protective film portion being comprised of the elements C, H and O such as C₂H₄ or C₂H₆". However, C₂H₄ and C₂H₆ are compounds that do not comprise O.

Appropriate correction is required.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1, 4-8, 10-14, 16, 18 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Saito (US2004/0166669) in view of Kawai et al. (US 2003/0054629).

With respect to claim 1, Saito discloses providing a structure having an overlying exposed conductive layer (1) formed there over; forming a dielectric layer (2) over the conductive layer Page 1, Paragraph [0027]; etching the dielectric layer using a via opening process to form an initial via (3) exposing a portion of the conductive layer (See Fig. 1B and Page 2, Paragraph [0028]); forming a protective film portion (4) over at least the exposed portion of the

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conductive layer (Page 2, Paragraph [0029]), the protective film portion being comprised of the elements C and H; patterning the dielectric layer (2) to reduce the initial via to a reduced via and to form a trench opening (6) substantially centered over the reduced via; the trench opening and the reduced via comprising the dual damascene opening (See Figs. 1E, 1F and Page 2, Paragraphs [0030], [0031] and [0032]).

Saito does not disclose forming an anti-reflective coating layer over the dielectric layer and etching the anti-reflective layer to form an initial via; and then patterning the anti-reflective layer to reduce the initial via.

Kawai et al. disclose providing a structure having a conductive layer (2) (Page 3, Paragraph [0047]); forming a dielectric layer (3) over the conductive layer (Page 3, Paragraph [0048]); forming an anti-reflective coating layer (4) over the dielectric layer (Page 3, Paragraph [0049]); etching the anti-reflective layer (4) and the dielectric layer using a via opening process to form an initial via (6) (See Fig. 1A and Page 3, Paragraph [0050]); forming a protective film portion (17) (See Fig. 1B and Page 3, Paragraph [0053]); patterning the anti-reflective locating layer and the dielectric layer (3) to reduce the initial via to a reduced via and to form a trench opening (10) substantially centered over the reduced via; the trench opening and the reduced via comprising the dual damascene opening (See Fig. 1C and Page 3, Paragraph [0054]).

It would have been within the scope of one of ordinary skill in the art to combine the teachings of Saito and Kawai et al. to enable the anti-reflective coating layer formation step of Kawai et al. to be performed in the process of

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Saito because it will improve the dimension accuracy of the initial via (6) (Page 3, Paragraph [0051] of Kawai et al.

Re claim 4, Kawai et al. disclose wherein the dielectric layer is a porous low-k dielectric layer having a dielectric constant of less than about 3.0.

Re claim 5, Kawai et al. disclose wherein the dielectric layer is a porous low-k dielectric layer having a dielectric constant of from about 1.0 to less than about 3.0.

Re claim 6, Kawai et al. disclose wherein the dielectric layer is a porous low-k dielectric layer having a dielectric constant of from about 1.5 to 2.8.

Re claim 12, Kawai et al. disclose including the step of forming an etch stop/liner layer (16) over the exposed conductive layer.

Re claim 13, Kawai et al. disclose disclose including the step of forming an etch stop/liner layer (16) over the exposed conductive layer; the etch stop/liner layer having a thickness of from about 200 to 1500 Å, which overlaps the recited thickness of claim 13 (50 to 2000 Å) and being comprised of the elements Si and C such as SiC.

Re claim 14, Kawai et al. disclose disclose including the step of forming an etch stop/liner layer (16) over the exposed conductive layer; the etch stop/liner layer having a thickness of from about 200 to 1500 Å, which overlaps the recited thickness of claim 13 (100 to 1000 Å) and being comprised of the elements Si and C such as SiC.

Re claim 16, Saito discloses wherein a via plug is formed within the initial via before formation of the trench opening (See Fig. 1B).

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Re claim 18, Saito discloses wherein the formation of trench opening utilizes a patterned photoresist masking layer (5) as a mask.

Re claim 19, Saito discloses wherein the formation of trench opening utilizes a patterned photoresist masking layer (5) as a mask.

Re claims 7, 8, 10 and 11, One of ordinary skill in the art would have been led to the recited thicknesses, temperature, pressure time and plasma power through routine experimentation to achieve a desired rate of annealing, device dimension, device associated characteristics and device density on the finished wafer. See MPEP 2144.05. In addition, the selection of thicknesses, temperature, pressure time and plasma power, it's obvious because it is a matter of determining optimum process conditions by routine experimentation with a limited number of species of result effective variables. These claims are prima facie obvious without showing that the claimed ranges achieve unexpected results relative to the prior art range. In re Woodruff, 16 USPQ2d 1935, 1937 (Fed. Cir. 1990). See also In re Huang, 40 USPQ2d 1685, 1688 (Fed. Cir. 1996)(claimed ranges or a result effective variable, which do not overlap the prior art ranges, are unpatentable unless they produce a new and unexpected result which is different in kind and not merely in degree from the results of the prior art). See also In re Boesch, 205 USPQ 215 (CCPA) (discovery of optimum value of result effective variable in known process is ordinarily within skill or art) and In re Aller, 105 USPQ 233 (CCPA 1995) (selection of optimum ranges within prior art general conditions is obvious).

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Note that the specification contains no disclosure of either the critical nature of the claimed thicknesses, temperature, pressure time and plasma power or any unexpected results arising therefrom. Where patentability is said to be based upon particular chosen thicknesses, temperature, pressure time and plasma power or upon another variable recited in a claim, the Applicant must show that the chosen thicknesses, temperature, pressure time and plasma power are critical. In re Woodruff, 919 F.2d 1575, 1578, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).

Allowable Subject Matter

Claims 2, 3, 9 and 17 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Claims 15, 20-22 and 43-50 are allowed.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Response to Arguments

Applicant's arguments filed 6/13/05 have been fully considered but they are not persuasive. Applicant argues that the combination of Saito and Kawai

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does not teach, "forming a protective film portion being comprised of the elements C, H and O". However, the claims are not so limited. Claim 1 as amended now recites, "forming a protective film portion being comprised of the elements C and H".

In response to applicant's argument that the examiner's conclusion of obviousness is based upon improper hindsight reasoning, it must be recognized that any judgment on obviousness is in a sense necessarily a reconstruction based upon hindsight reasoning. But so long as it takes into account only knowledge which was within the level of ordinary skill at the time the claimed invention was made, and does not include knowledge gleaned only from the applicant's disclosure, such a reconstruction is proper. See *In re McLaughlin*, 443 F.2d 1392, 170 USPQ 209 (CCPA 1971).

Applicant argues that it is apparent from reading of the Saito patent and the Kawai patent that neither recognized the problem of resolving the dial damascene porous low-k surface roughness resulting from the liner removal process. However, it is not necessary for the reference to disclose that the process of the reference is performed to achieve the same goals as applicant or to obtain the same advantages recognized by applicant. It is sufficient that the process suggested by the reference alone or in combination with the remaining references is encompassed by the instant claims.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michelle Estrada whose telephone number is 571-272-1858. The examiner can normally be reached on Monday through Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matthew Smith can be reached on 571-272-1907. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 571-272-2800.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Michelle Estrada
Patent Examiner
Art Unit 2823

ME
August 20, 2005